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ABSTRACT

Defining videotex and teletext as the most revolutionary innovations in communication since the invention of movable type, this paper describes The Interactive Videotex Project of public television station KPBS in San Diego, California. Following a brief overview of videotex and teletext technologies, the paper discusses (1) the development of the Interactive Videotext Project and its first televised series, "Understanding Your Investments"; (2) the INDAX two-way cable system; (3) videotex design elements, including the nature of the medium, the content area, the users, and the technical parameters; (4) the working model of the instructional design of the investment series; (5) considerations in designing and writing videotex screens, including the INDAX system design, the needs of the user, and subject matter; (6) the step-by-step development of one lesson in the investment series; (7) the evaluation of the Project; and (8) the role of videotex on public television. Appendixes contain description of the working model for the investment series and other materials drawn from the Project.
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Report of the

KPBS INTERACTIVE VIDEOTEX PROJECT

by

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Final Report of the
KPBS INTERACTIVE VIDEOTEX PROJECT

OVERVIEW

Spawned by the marriage of television and computer technology, videotex and teletext are emerging as the most revolutionary innovation in communication since Gutenberg. A number of prominent U.S. corporations are gambling fortunes on whether the public will want -- moreover be willing to pay for -- printed information and other services delivered via their TV set. A recent study by Booz Allen and Hamilton predicts that videotex/teletext services will be a 25-30 billion-dollar-a-year industry by the end of the decade.

The potential services that may be delivered to the user's home are virtually unlimited. They include services such as news; electronic messaging; listing of local entertainment events; food and dining advice such as menus and restaurant reviews; education including language lessons, drivers' test drills and basic instruction; consumer information about product performance; shopping and banking at home; games and quizzes; sports results; health and medical information; travel schedules

and vacation planning; money management; real estate listings; and even automobile care.

Despite their similarities videotex and teletext are actually very different. Teletext is broadcast with the regular TV signal to the home receiver and prints information and graphics on the TV screen using an unused "vertical blanking interval." It requires a decoder for the TV set to receive and display the teletext signal, and a small, hand-held keypad to summon up the pages. The number of pages in a teletext system is usually limited to 100-200 pages.

Videotex, on the other hand, is completely different. The user has direct access, either by cable TV or telephone lines, to the database of a central computer. The number of pages or amount of information that may be stored is virtually unlimited. This medium is "interactive" since users may not only call up information, but can also "transact" business such as purchase tickets, bank, shop, play video games, vote, gamble, send electronic mail, take a test, order a textbook.

The potentialities of these technologies for educational purposes are obvious and yet confusing. Will consumers be disposed to use the medium for acquiring educational information. What kinds of educational information are best suited for videotex?

How effective will information be when presented via videotex?
What role will public broadcasting play in this fledgling industry?

KPBS VIDEOTEX PROJECT

Under a grant from the Corporation for Public Broadcasting, KPBS, public television in San Diego, and the Center for Communications, San Diego State University, studied the implications of videotex for education and public broadcasting.

The KPBS Interactive Videotex Project became operational on July 10, 1982, when the twelve-part series "Understanding Your Investments" premiered on KPBS-TV and made its concurrent debut on Cox Cable's INDAX videotex system. In effect, the KPBS Interactive Videotex Project was composed of two components -- a conventional television series, "Understanding Your Investments," delivered via open-air broadcast with cable repeats, and an accompanying videotex segment, which provided electronic course materials, delivered via Cox Cable's INDAX system.

INDAX uses two-way cable to connect home viewers to a central computer. Using a hand-held keypad these viewers may request information from the computer's memory and display it on their television set. When the project began approximately 150 Cox Cable subscribers had been selected to pilot test the system. By September, 1982, when the project was completed, Cox had 300 INDAX homes.

Each week KPBS-TV viewers watched host Jesse Sank present a new lesson on investments. Then INDAX viewers, through their keypad, selected a number of informational items which related to that week's lesson. A detailed description of the videotex information developed for this project will be discussed in a subsequent section. First, however, an understanding of the overall videotex design elements is appropriate.

VIDEOTEX DESIGN ELEMENTS

In developing an overall design for the videotex information to be presented, four factors were taken into consideration: (1) the nature of the medium; (2) the content area; (3) the user; (4) the technical parameters of the system.

Factor 1: The Nature of the Medium

Traditionally, television has been a passive form of entertainment, requiring little interaction on the part of the user. Interactive videotex, as its name implies, requires that the user become an active participant in the learning process. The user is presented with graphic or textual information on the television screen, which requires that the user read the information and make choices in order to receive the next page of information. Moreover, since the topic of investments is strictly "hard" information, presumably users are attracted to

the topic by a need for basic information and not for entertainment.

Factor 2: The Content Area

"Understanding Your Investments" was designed to provide basic background information as well as information on investments in the current economy. Thus, the timeliness of the subject was an important consideration. Furthermore, if the software is in place, videotex systems are capable of delivering constantly updated information to the home.

Timely information was managed in two sections, or branches of the data base. Current material was isolated in two sections -- Market Barometers and Stock Watch. This information was segmented to permit updating.

Factor 3: The User

This factor addresses the critical "unknown" regarding how videotex will actually be used, and therefore how the product should be designed. For each subject matter, these questions have highly individualized answers. The system should be designed to facilitate user information selection and foster user acceptance. In the current jargon, the system should be "user friendly." The information must be presented in clear and consistent patterns in order for the user to feel comfortable making choices and, ultimately, locating the desired information.

Factor 4: Technical Parameters

The technical parameters of any videotex experiment are system-dependent since currently there are no adopted technical standards for videotex. Therefore, the technical parameters discussed herein refer specifically to the Cox Cable Communications' INDAX system.

In general, one-way videotex was the data transmission system used for delivering the investments videotex information. This broadband communication channel allows large numbers of frames (screens, pages) to be distributed in a one-way mode via a cable television system.

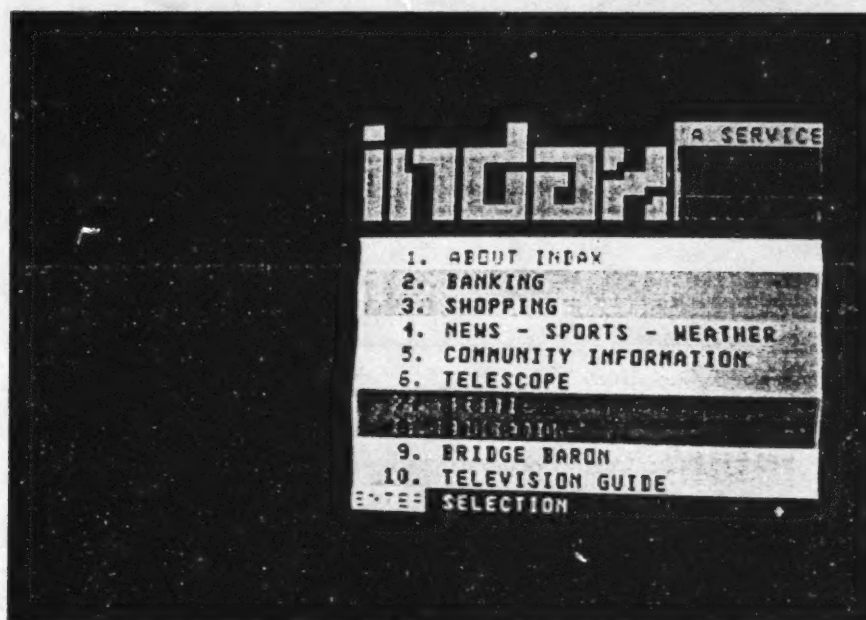
The information is converted to a digital form. With INDAX, this digital data is delivered using a full (or broadband) channel, instead of a few lines in the vertical blanking interval used by most "broadcast" teletext systems. The digital data is detected by a special decoder or HTU. Once a frame is requested by a user it is transferred from the channel to full frame display via graphic and text character generator which is part of the decoder circuitry.

If the software is in place and if there is ample computer storage, thousands of frames may be transmitted with reasonable response times. However, in this particular pilot study, software and storage were not sufficient to deliver the entire electronic investments textbook at a reasonable response rate.

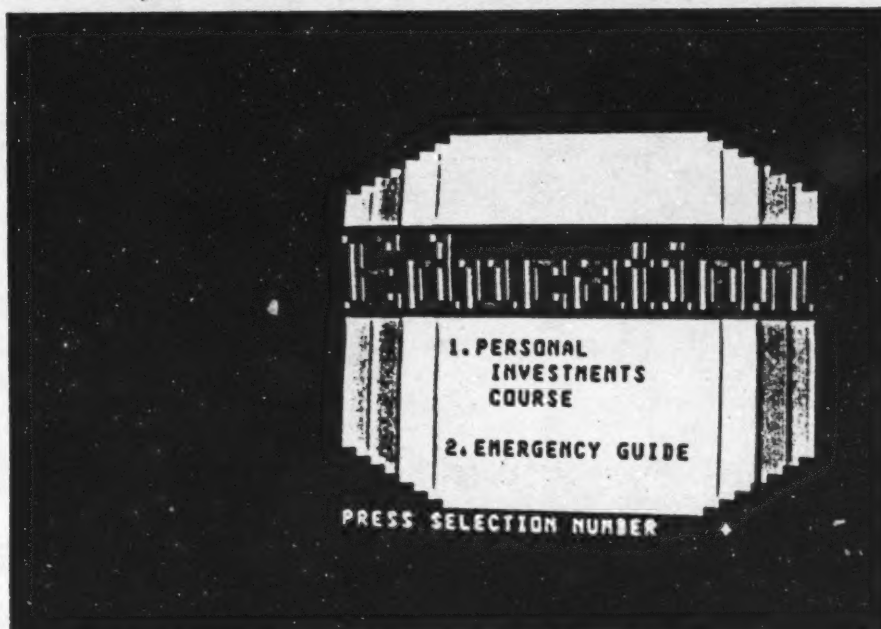
Therefore, only two lessons were available "live" in the system at any one time.

The architecture of the database also presented other constraints. All users enter the INDAX system through what is called a "master menu." The one-way database is an "inverted tree" structure allowing the user to branch down from the master menu through five levels of the database. Up to 99 selections may be listed on any menu, and each selection may contain up to 99 terminal pages or screens of information.

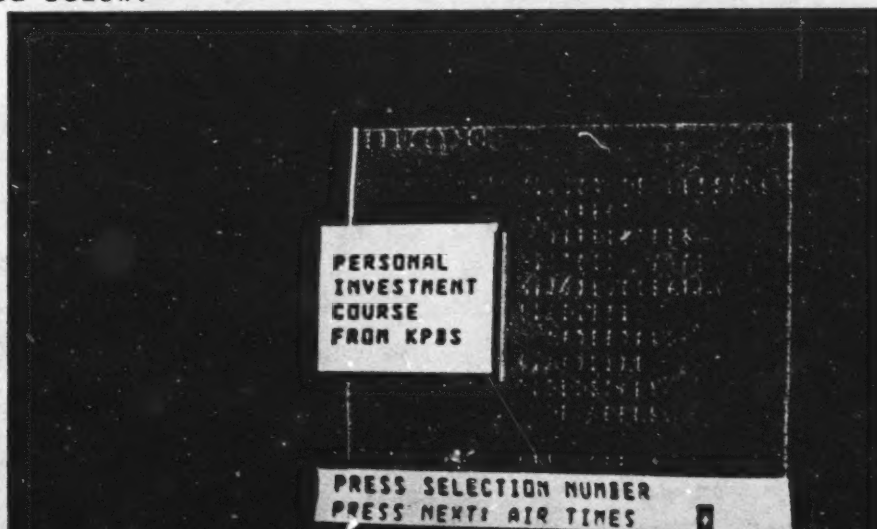
Thus, in order to enter the investments "textbook" the user enters the master menu (level 0), which looks like the following.



From these nine choices, the user would select number 8, Education, and then drop to level 1 which presents the educational items currently available in INDAX such as:



From the education menu (level 1), the user would select "Investments" and branch to the Investments Menu at level 2 as depicted below.



The preceding "Investments" menu (level 2) presents the user with the first choices on the topic of investments. There are now three levels remaining with which to present investment information.

The four factors discussed above -- the medium, the content area, the user, and the technical parameters -- established a framework for the instructional design of the investments videotex material.

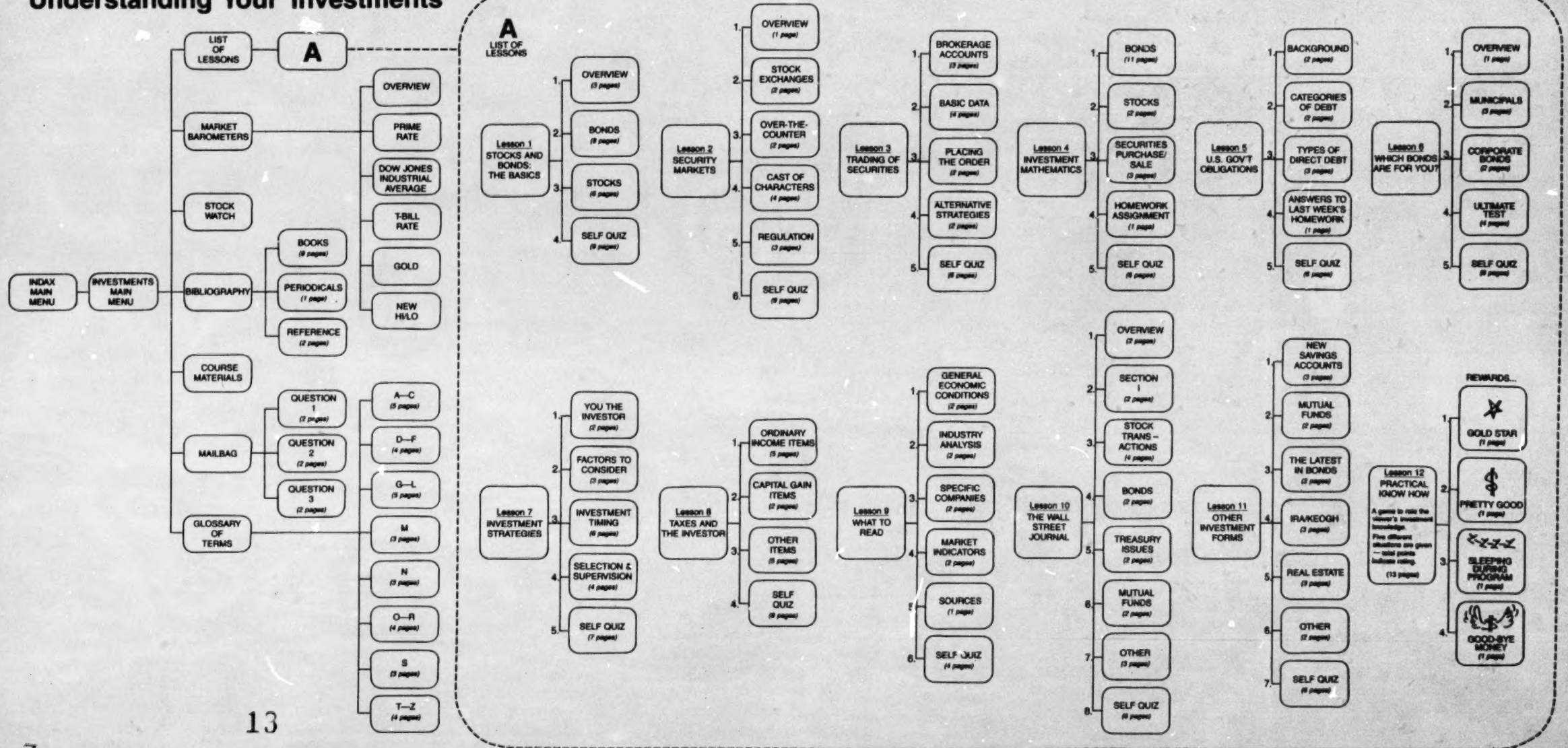
THE FLOWCHART: A WORKING MODEL OF THE INSTRUCTIONAL DESIGN

The flowchart translates the overall instructional design of the investments project into an operational system. Our goals were: (1) to construct a "user friendly" database, and; (2) to maximize the use of a variety of INDAX capabilities and functions.

The structure of the flowchart (Exhibit A) portrays various choices, or paths, available to the user. It serves as a "road map" to the information stored in the database. The database is formatted into screens. The user encounters two types of screens:

1. The menu represents decision points to the user. Menus always present the user with numbered choices in order to branch to the next level. Menus guide the user to the next type of page -- terminal pages.
2. Terminal pages present graphic or textual information.

KPBS INTERACTIVE VIDEOTEX PROJECT "Understanding Your Investments"



From a menu page, the user makes a choice and branches to a lower level of the database (up to five levels). From a terminal page, the user may progress through a series of information pages (up to 99 pages) by pressing "next." The entire database for this videotex project consisted of 19 menus and 291 terminal pages. A detailed description of the various branches contained within the investments flowchart is discussed in Appendix A.

Overall Format

The investments flowchart contained seven branches, or major divisions within the information base. They were:

- (1) List of Lessons, (2) Market Barometers, (3) Stock Watch,
- (4) Bibliography, (5) Course Materials, (6) Mailbag,
- (7) Glossary of Terms.

These seven branches were designed to test a variety of INDAX capabilities, including the "reveal" function for self quiz, home shopping for ordering course materials, and maximum use of the software capabilities.

The instructional design was also intended to test a variety of educational formats, including "class notes" or background information in the List of Lessons section, timely updated information in Market Barometers and Stock Watch, additional references in Bibliography and Glossary, viewer feedback in Mailbag, and testing in Self Quiz.

Another creative element was also added -- an instructional game. The last lesson, "Practical Know How," presented an ideal opportunity to experiment with the use of a game format. Users were presented with five separate situations and asked to select the best investment strategy for each of the situations. Users kept their score with pencil and paper. After tallying their points, users were able to rate their investments knowledge through a series of videotex screens. The game concept appears to be particularly well suited for other educational videotex programs.

SPECIFIC CONSIDERATIONS: DESIGNING AND WRITING VIDEOTEX SCREENS

The previous section discussed the overall structure of the "Understanding Your Investments" database. This section will focus on the specifics of screen writing and design.

Of paramount importance is to design and write videotex screens which maintain a consistent high-quality appearance within the entire database. Videotex screen development considered three major factors: (1) INDAX system design, (2) needs of the user, (3) subject matter.

INDAX System Design

It is important to understand the basic design of the INDAX system. The system characteristics include low resolution

alphamosaic graphics, exclusive use of uppercase letters, and a sixteen-color palate.

The information stored in the data base is formatted into frames or screens. The blueprint for the INDAX frames has been developed to accommodate both text and semigraphics, which is used to create illustrations, diagrams, charts, etc.

The matrix shown in Exhibit B illustrates how these two design elements -- text and semigraphics -- can be incorporated into screens. Each INDAX frame is comprised of a matrix surrounded by a border. The matrix contains sixteen lines each with 32 characters in the text design element. These 512 blocks per frame are the largest unit within the matrix grid.

For semigraphics, each block can be subdivided into six units or pixels (short for picture elements) arranged two across and three down. The pixels are filled in within each block to create graphic displays or illustrations. The system is termed "alphamosaic" because INDAX uses semigraphic character codes for recording graphic shapes. Alphamosaic refers to all graphic systems which utilize tile-shaped elements to construct visuals.

Needs of the User

A primary consideration was to present the information on each screen in a clear and consistent pattern in order for the user to feel confident about finding and identifying information

Pixel
small-
est
graphic
unit)

Block
small-
est text
unit)

Border
↔

EXHIBIT B

14

in the database. Basic guidelines for screen design were developed to assure clarity and ease of understanding by the user. A consistent pattern for each screen enabled the user to quickly become familiar with the information and easily locate it. On both menus and terminal pages certain lines were set aside for specific information.

Line 1 on both menus and terminal pages always contained the name of the branch in which that particular screen was located. On terminal pages, line 1 also stated the page and number of pages in that section; e.g., "3 of 6."

Line 2 on both menus and terminal pages gave the title of that section; e.g., "Self Quiz." The title was set off by the use of color and a semigraphic "drop shadow."

Lines 4-15 were reserved for the subject matter or menu choices. Menu choices were always numbered. When terminal pages listed information, alphabetic letters, astericks, or blocks were used instead of numbers to avoid confusion.

Line 16 on every screen, except Self Quiz, was reserved for the "routing instructions" and was set off by the use of a different color -- black letters on white background.

Routing instructions prompt the user as to the next command to be executed. For example, on menu pages, routing instructions were always "PRESS SELECTION NUMBER." Routing instructions on terminal pages followed the format "PRESS NEXT: BONDS (CONT.)" -- or whatever the topic of the next page. This gave

the viewer a sense of what information followed. On the final terminal page within each section, the viewer was told to "PRESS MENU" to complete the loop. The user was then returned to the menu one level above for further selections. It is extremely important that routing instructions be clear, concise, and consistently located in the same area of the screen to ensure that the user does not become "lost" in the database.

Subject Matter

Also related to the user's needs is the actual presentation of the material. The careful use of color, text, space, and semigraphic patterns all serve to organize and simplify information on the screen.

Color can enhance communication and display of information by highlighting key elements on the screen. Color can also be distracting and confusing if not used properly. A standard template was designed for "Understanding Your Investments." This standard template created a uniform high-quality appearance for the screens. A black border was selected with a standard neutral background color of dark yellow. Light yellow was used to highlight the title of each frame on line 2 and was set off by a black "drop shadow" using semigraphic codes on line 3. The use of light yellow within the body of the screen served to highlight key elements by forming a "highlight block" next to the key concept.

Another means of placing emphasis on a key word or phrase was the use of a "reversal" -- black letters on a white background space. Reversals were used sparingly since they tended to "jump off the screen" when used to excess.

Reversals, however, were consistently used for the routing instructions which appeared on line 16 of every screen. The use of color in this instance helped to separate the routing instructions from the content area. Consistent and appropriate use of color facilitates visual differentiation of areas on the screen.

Text on the screen also presents a number of considerations such as the number of words per screen, use of space, information presentation, and writing style.

2/ Although there is no clear-cut evidence as to how sparse or dense a screen should be to facilitate user retention of information, it is generally held that optimal frame fill for message content is approximately 50 words per frame or about 60% full. The remaining 40% is utilized for frame ID, routing, and blank space to aid the user in reading the text.

Writing for videotex screens, by necessity, dictates brevity. The virtue of the precise word is indisputable. Often, the use of an outline format is appropriate for organizing material. Careful presentation of information on the screen allows the viewer to quickly scan the screen for information.

Graphics, as mentioned before, involves the coding of pixels in the INDAX semigraphics mode. This process is very time consuming and, therefore, limited the number of graphics that could be incorporated in this project.

Graphics served two major purposes in this project. First, to provide uniformity and a stylized appearance to the entire database. This was accomplished by adding a "drop shadow" to the title on each screen. This simple design element gave a three-dimensional appearance to the screen and added visual interest. The second purpose for the semigraphic design element was to present simple graphs and charts found in the Market Barometers and Stock Watch sections. Aside from these two purposes, a limited number of pictures or simple drawings were used on individualized "Lesson" menu pages to depict the content of the lesson.

LESSON 6: AN EXAMPLE OF THE PROCESS

Lesson 6, "Which Bonds Are For You?", is one of twelve lessons in "Understanding Your Investments." For illustrative purposes, the development of Lesson 6 is outlined in the following steps.

- | | |
|--------|---------------------------------------|
| Step 1 | Research content area of investments. |
| Step 2 | Establish flowchart. |

- Step 3 Outline each lesson's content. This outline served as the basis for both the videotex portion as well as the conventional television presentation.
- Step 4 Design screen template. A basic format was designed for both menu pages and terminal pages (see Exhibit C).
- Step 5 Text information was typed on manuscript forms. Manuscript forms had to take into account template design considerations; e.g., drop shadow semi-graphic codes on line 3 (see Exhibit D).
- Step 6 Load information into computer. Each manuscript was assigned a filename and was linked appropriately in the computer database; information contained on each manuscript was then input into the computer.

The final product is depicted in the photographs contained in Exhibit E.

KPBS INTERACTIVE VIDEOTEX PROJECT EVALUATION

The KPBS Interactive Videotex Project evaluation was initially approached as a field experiment, where direct comparisons could be made between households with interactive cable services and households without interactive cable services. However, the households receiving interactive cable services could not be selected at random: the INDAX households were drawn from among a small number of initial INDAX subscribers. The bulk of the some 400 INDAX subscribers in San Diego are part of a marketing

study conducted by the A.C. Nielsen Company. To minimize contamination of both the Nielsen study, and this evaluation, these Nielsen households were excluded from those studied.

A second problem emerged during the evaluation study itself. The scheduled time for the "Understanding Your Investments" series was changed midway through the twelve-part series. This further reduced the number of households actually watching the series in any given week.

Despite these limitations, several valuable findings were obtained from the evaluation study. For all the above reasons, these findings are best regarded as promising leads for further study of videotex services supporting telecourses.

The design of the evaluation included three groups of households. The first group, consisting of 20 households, received both the telecourse and the various interactive cable services supplementing the telecourse. The second group, consisting of 22 households, received only the telecourse without any supplemental materials in either print form or over the INDAX system. The third group, made up of only nine households, consisted of those viewing the "Understanding Your Investment" series who also wrote to KPBS requesting a printed supplemental information package. That information package included most of the material available to INDAX households over interactive cable. Due to high initial interest, this group differs from the other two in terms of motivation.

The 20 households that received both the telecourse and interactive cable services were asked to participate through a letter from the KPBS Interactive Videotex Project. Because of the Nielsen study, only 150 households were eligible for contact. Budgetary constraints precluded the use of subject rewards or incentives for participating in the evaluation study. However, a postcard was included in the initial mailing to each INDAX household, asking them to participate in the study and "confirm your participation" by signing and returning the postcard. The purpose of this procedure was to engage the participant in a "psychological contract" to help ensure continued participation. This agreement to participate in the study is best regarded as "soft."

The 22 households viewing the telecourse only were contacted through a master listing of current cable subscribers provided by Cox Cable. Cable subscribers were considered most comparable to the INDAX households, as all INDAX households were originally drawn from the existing cable-subscribing households in the INDAX test zone. Both groups were similar in terms of cable-subscribing behavior. As with the INDAX households, the cable-subscribing households were asked to make a verbal commitment to participate through a telephone interview, followed up by a written confirmation through a postcard. Participation among the cable-subscribing households not receiving supplemental videotex services was also regarded as "soft."

The nine households that requested the printed supplemental materials were included solely for comparison purposes. Unlike the INDAX households and those watching the series without videotex services, these participants felt strong prior interest and motivation to seek out the supplemental information. Thus, these households differed significantly from both the INDAX and non-INDAX households, where the primary motivation for viewing the program was the request to participate in the evaluation study by KPBS. These differences in motivation are quite apparent in the results of the evaluation.

The evaluation interviews occurred just prior to the series premiere on July 10 and after the sixth part of the twelve-part series. A final questionnaire was mailed to all participating households after the last part of the series. Data from these interviews are the core of the evaluation.

During the first wave of phone interviews, background information was collected from households in each of the three groups. Among the INDAX households, 44% of the participants were men and 56% were women. Among the cable households not receiving the videotex supplemental materials, 47% were men and 53% were women. Among those participating in the study who had written in to request the printed supplemental materials, 44% were men and 56% were women.

Participants in the INDAX households ranged in age from 26 to 69 years, with an average age of 50.8 years. Participants in the cable households not receiving videotex supplemental materials ranged in age from 19 to 77 years. The average age was 43.8 years. Among the participants who requested the printed supplement, ages ranged from 33 to 73 years, with an average of 56.1 years.

Participants in the INDAX households tended to have higher levels of education, when compared to the cable household participants not receiving videotex supplemental materials. However, those participants requesting the printed supplemental materials included a greater percentage with advanced degrees. The educational levels of participants are shown in Table 1.

Table 1.
Educational Levels of Participants

	INDAX	Cable (No INDAX)	Printed Supplement
High School Graduate Only	29%	35%	11%
Some College Studies	29%	43%	34%
Undergraduate Degree	24%	13%	22%
Advanced Degree	18%	9%	33%

Some 94% of the participants in the INDAX households had never taken a telecourse before. Among the cable households not receiving videotex supplemental materials, 91% of the participants had never participated in a prior telecourse. Among those participants who had requested printed supplemental materials, none had participated in a prior telecourse.

Among INDAX households, 94% of the participants had never taken a correspondence course. Among participants from cable households not receiving videotex materials, none had taken a correspondence course. Among participants who had requested printed supplemental materials, 71% had never taken a correspondence course.

Among INDAX households, only 6% of the participants had ever taken a course featuring computer-aided instruction, compared to 17% of the participants from the cable households without videotex services. None of the participants who requested supplemental printed materials had ever received computer-aided instruction.

Some 70% of the INDAX participants owned investment stocks, ranging in value from \$1,000 to a high of \$200,000. Among the participants from cable households without supplemental videotex materials, only 55% owned stock. The value ranged from \$100 to \$80,000. Participants who had requested supplemental printed materials were made up of 71% stock owners, with value ranging from \$10,000 to \$40,000.

Regarding investment real estate, all three groups were about equal in the level of participation in such investment activities. Among INDAX participants, 41% owned investment real estate, exactly equal to the percentage of real estate investors among cable participants without videotex supplemental materials. Among participants who requested printed supplemental materials, 43% owned investment real estate.

Sharp differences exist in the level of participation in IRA and KEOGH retirement plans. Among INDAX participants, 63% participated in such retirement plans, compared to only 18% of the cable household participants who did not receive supplemental videotex materials. None of the participants who had requested the supplemental printed materials were participating in such retirement plans.

Regarding perceived knowledge of the content of the "Understanding Your Investment" series, the INDAX participants considered themselves generally more knowledgeable than the participants who did not receive the supplemental videotex services. The participants who had requested the supplemental printed materials considered themselves least knowledgeable overall. The breakdown of prior knowledge of personal finances is provided in Table 2 below.

Table 2.
Prior Knowledge of Personal Finances

	INDAX	Cable (No INDAX)	Printed Supplement
Very Knowledgeable	47%	18%	0%
Knowledgeable	47%	55%	43%
Not Very Knowledgeable	6%	32%	57%

Participants in the evaluation were asked if they used computers in their work. The INDAX participants were the most experienced, with 53% of that group working with computers. The participants from cable households without videotex supplemental materials included 27% who worked with computers. None of the participants who had requested supplemental printed materials had worked with computers.

The purpose of the first wave of interviews was to establish a baseline of data on participant background characteristics relevant to the "Understanding Your Investment" series. What can be learned from this information? Regarding gender and education, participants appear roughly equal. The INDAX participants and the participants requesting printed supplemental material are slightly more educated than the participants in the cable households not receiving videotex services. All three groups

were made up mostly of individuals who had never taken a tele-course, a correspondence course or had received computer-aided instruction. Thus, prior instructional activities for personal development -- activities most likely those of the "Understanding Your Investment" series -- were roughly comparable.

Regarding motivation to take the course, however, important differences are apparent. Both INDAX participants and participants requesting supplemental printed materials were more likely to own investment stock than were participants from cable households without supplemental videotex services. INDAX participants were much more likely to be participants in individual retirement plans. While these factors might indicate a greater need to know the content of the "Understanding Your Investments" series among the INDAX participants, such a need to know is offset by how INDAX participants regarded their prior knowledge of these topics. In general, INDAX participants considered themselves relatively expert on personal investments before the series began. The participants requesting supplemental printed materials, on the other hand, regarded themselves as relatively uninformed about issues of personal investments. These factors exert some impact on the outcome of the evaluation study.

The second wave of interviews occurred midway through the series. The interviews were completed by telephone. During this

second wave of interviews, reactions to the "Understanding Your Investments" series were measured. At the same time, separate evaluations were made of both the videotex supplemental materials, among INDAX participants, and the printed supplemental materials among those participants requesting printed materials.

Viewership of the "Understanding Your Investments" series was spotty among participants in the evaluation study. Only one participant, an individual who had written KPBS for the supplemental printed materials, saw all of the programs. Some participants cited the "talking head" format of the program as reasons for not watching some or all of the programs, describing the presentation as "boring" or "slow." However, most participants indicated that various problems had interfered with their viewing of the series.

Combining the cable subscribers without videotex supplemental materials together with the participants who requested printed supplemental materials, the participants can be classified as either INDAX or non-INDAX. In Table 3, a breakdown is provided of the reasons given by participants for not watching some or all of the "Understanding Your Investments" series.

Table 3.
Reasons for Not Watching the Program

	INDAX Participants	Non-INDAX Participants
Show Is On At Bad Time	37%	17%
Conflicts With Other Activities (work, guests, etc.)	25%	42%
Out Of Town	25%	8%
Forgot	13%	33%

Among the individual weekly programs of the series, the program on "Stocks & Bonds" was the most popular: 100% of the INDAX participants saw that program and 71% of the non-INDAX participants viewed it. The second most viewed program was dedicated to "Security Markets" with 57% of both the INDAX and non-INDAX participants watching that program. The third most popular program was dedicated to the question: "Which Bonds Are For You?" Among non-INDAX participants, 43% saw that program while 29% of the INDAX participants saw it.

The above finding underscores a key finding of the evaluation: the telecourse-and-videotex combination retains a major disadvantage of all broadcast media and reduces the impact of a key advantage of the videotex medium. A key virtue of videotex

services is that an "active" audience member can call up information when he or she wants to. Broadcast media, on the other hand, make information available only at sender-selected times, forcing the audience member into a "passive" role. The inability of even the highly-motivated participant (who sought out supplemental printed information) to view the programs consistently indicates a pressing need to study "stand alone" videotex educational packages.

Certain questions in the second wave of interviews were directed at the evaluation of the supplemental videotex services and were asked only of the INDAX participants. INDAX participants were asked to use a one-to-ten rating scale to evaluate the overall usefulness of the videotex screens of information. The average score was 7.5, indicating an overall favorable rating to the videotex supplemental services. This overall evaluation was underscored by the comments of INDAX participants when they were asked to summarize their feelings toward videotex support of telecourses like "Understanding Your Investments." Participants variously described the videotex supplement as "excellent," "has a good future," "I liked it!" and "very promising!" One INDAX participant simply exclaimed: "Great!" Only one INDAX participant voiced a negative reaction, saying that he "wasn't impressed" with the videotex supplement. Another participant indicated he would prefer a radio telecourse supported by videotex services.

When INDAX participants were asked what they liked about the INDAX supplemental services, most cited INDAX as "handy" or "convenient." One participant praised its "educational value" while another remarked that the videotex package was "concise." Another participant remarked that the videotex materials helped to "personalize" the telecourse, indicating that she appreciated the "ability to interact" with the information in the "Understanding Your Investment" series.

When asked what they disliked about the INDAX supplemental services, several INDAX participants rapped the video portion of the series, describing it as "boring and slow" and suggesting "less lecture and more varied format" in subsequent telecourses supplemented with videotex. The only criticism directed at the videotex portion of the package was a comment regarding "breakdowns" of the INDAX operating system.

Regarding frequency of use of the INDAX supplemental materials, most INDAX participants limited their use to once a week or less. Within the package of videotex supplemental services, 43% of the INDAX participants indicated that they used the "class notes" on INDAX. All INDAX participants described the notes as "somewhat" helpful. The self-quiz activities in the videotex package, which use the REVEAL function key, were rated 7.5 on a one-to-ten usefulness scale, where ten is the top score.*

*The REVEAL function key permits the student to be asked a question by the videotex system without showing the answer. After the student answers the question, the REVEAL key is pressed to "reveal" the right answer.

In order to make some comparisons between supplemental services in the videotex medium and in a printed pulp medium, participants who requested the printed supplement were asked a separate set of questions. Because the printed supplement contained nearly all the information contained in the videotex package, some comparisons could be made of the modality of information presentation (videotex vs. pulp modality). This comparison, however, is confounded by the fact that pulp users possessed higher motivation to learn the material in the "Understanding Your Investments" series, as indicated by their seeking out of the supplemental information and their self-perception of ignorance regarding personal investments.

The participants who requested the printed supplement were asked to use the one-to-ten usefulness scale to rate the printed supplement, the same scale INDAX participants had used to rate the usefulness of the videotex supplement. The printed supplement was given an average rating of 8.2 on the ten point scale, while the videotex supplement was rated 7.5. Given the differences in motivation and the small number of participants, the difference in the ratings is not significant.

The same participants rated how informative they felt the printed materials to be, using the same one-to-ten scale. The average rating was 8.4. Regarding frequency of use, participants

who requested the printed supplement indicated that they either used the printed materials "often" (50% of these participants) or "almost never" (50% of these participants).

How did all the groups evaluate the "Understanding Your Investments" series as a whole? Did participants with the supplemental videotex services evaluate the program differently than those without the videotex services?

To find out, all participants in the survey were asked to use the one-to-ten rating scale to evaluate the interest, the informativeness, and the usefulness of the "Understanding Your Investments" series. The ratings from each of the three groups of participants are shown in Table 4.

Table 4.
Overall Evaluation of the Series*

	INDAX	Cable (No INDAX)	Printed Supplement
Interest in Series	6.4	5.0	9.4
Informativeness of Series	8.0	5.0	8.8
Usefulness of Series	6.6	8.0	8.7

*Ratings are based on a one-to-ten scale where ten is the top score.

As indicated in Table 4, the overall evaluations tend to be highest among the participants who requested the supplemental printed materials. This higher rating is most likely the result of higher motivation among these participants, rather than the effect of using the printed or pulp supplement. In general, the videotex participants tend to give the series higher interest and informativeness scores but lower usefulness scores, when compared to cable household participants without supplemental videotex services.

As an aid to teaching, videotex might also be regarded in terms of enhanced educational experiences for participants in telecourses such as "Understanding Your Investments." All participants were asked to indicate how much they felt that they had learned about personal investments from the "Understanding Your Investments" series. The responses of the three groups of participants are presented in Table 5.

Table 5.

What Participants Felt They Learned From Series

	INDAX	Cable (No INDAX)	Printed Supplement
Great Deal	14%	0%	71%
Something	57%	0%	29%
Not Much	29%	100%	0%
Nothing	0%	0%	0%

Overall, all participants felt they learned something about investments from the series. On the surface, printed supplements appear more effective than videotex supplements in enhancing the student's feeling of learning something from the telecourse. However, such a conclusion ignores the big differences in motivation and feelings of ignorance prior to seeing the series. When videotex participants are compared to participants without supplemental materials of any kind, the evidence indicates that videotex does enhance the student's feeling of having learned from the series.

In summary, videotex services appear to provide a useful supplement to telecourses. Participants who had access to videotex services were highly complimentary of both the present state and future potential of videotex supplements to telecourses. At the same time, the video portion of the series imposed access problems for many viewers of the course. The "when you want it" advantage of videotex is lost when it supplements a video telecourse. Further study is needed of "stand alone" videotex education materials.

Great caution is required when the findings of this evaluation are considered. The evaluation design was flawed by self-selection of participants, the small number of participants,

and the lack of experimental control over a number of outside factors that could influence the outcome of the evaluation.* At the same time, the findings of this evaluation can help focus and direct future research in the area of videotex educational services.

VIDEOTEX AND PUBLIC BROADCASTING

The KPBS videotex project, particularly in the context of parallel work conducted by other public stations and by the Center for Communications at San Diego State University, suggests, intriguing prospects for videotex as a part of public broadcasting.

*A key problem in this regard is experimental mortality, the "dropout" rate of participants from the study. Originally, a third wave of data collection at the end of the series was anticipated to provide valuable data on participant evaluation of the series. However, the INDAX participants had been "thinned out" by the program schedule changes and other factors to the point where only three INDAX participants had viewed sufficient programs to provide any meaningful new information since the second wave of interviews. For this reason, the third wave of data was excluded from this analysis. The experimental mortality rate was less severe among non-INDAX participants, but without comparison participants among INDAX users, inclusion of these data would be meaningless.

The KPBS project was concerned with one of the most straightforward applications: the use of videotex as a wrap-around to a conventional video presentation, much as print material is commonly used now. As support for the video program the viewer could, on his own schedule, consult electronic lecture notes, glossary, and supplementary information, and take an informal quiz to test his understanding of the material. It is clear that such a use of videotex can be useful to public broadcasting audiences.

The next logical steps would be to apply similar techniques to more complex material and to use videotex alone to present similar material. KPBS and the Center for Communications are developing both ideas now.

Meanwhile, the uses of teletext as a public television electronic magazine have been explored by KCET and WETA; numerous studies, including those of the Center for Communications, have been examining consumer preferences in everything from topic selection to screen design to access strategies; and the Nebraska project has been focussed on aspects of instruction using videotex as a solo medium. Data transmitted by FM SCA channels offers public radio additional possibilities for public service and for system support.

Clearly a great many questions remain regarding the long-range direction -- and even the commercial viability -- of videotex. Even the limited work undertaken to date, however, indicates several areas of interest for public broadcasting. Some of these are as follows.

Public broadcasting's service mandates include formal and informal instruction, and these represent some of the most obvious applications of this new technology. As in the KPBS project, videotex can be used as a wraparound with conventional video programs, providing notes, glossary, supplementary material, and tests. At least in certain areas of instruction videotex can stand alone. These include drill material such as remedial math or English, as well as straightforward factual material such as the rules portion of drivers' education courses. The Nebraska project suggests other variations.

As public broadcasting stations extend their service into non-broadcast areas, other combinations suggest themselves. For example, the videodisc-microcomputer combination has been extended in Germany to videodisc-videotex in order to facilitate videodisc-based catalog shopping, and similar techniques could support public service activities. Another prospective area

for development will be downloading of material to the home terminal; this material may be a sequence of pages, an operating program, phone numbers of other systems to be dialed automatically if the user elects a given branch, etc.

Related technology may also help overcome one of the barriers to the use of television for instruction: with cable transmission and pay-per-view technology it is possible to charge students for a course, thus overcoming the problem of (for example) university extension services which must be self-sustaining.

The polling possibilities of videotex systems can enhance public participation in public broadcasting programs and in such decisions as program preferences. A particularly interesting question involves the ways in which videotex might expand the information services offered by public broadcasting. For example, should public broadcasting maintain local videotex databases dealing with basic citizens' information: the membership of boards and commissions, the agenda of the forthcoming city council meeting, today's actions of the planning commission, etc? How can videotex enhance the presentation of voter issues which are an election-year staple of public broadcasting stations? A great many information areas suggest themselves as candidates for development by public broadcasting stations.

Videotex may also be directly useful in the business of public broadcasting. The transactional possibilities of this new technology might be applicable in enlisting subscribers, in conducting televised auctions, etc.

Can videotex represent an income source for public broadcasting? It's still too early to tell, but the question is intriguing enough to demand a closer look.

In short, the possibilities of videotex as an enhancement or component of public broadcasting have scarcely been tapped. While the technology is not yet fixed, enough is known to indicate useful prospects. Public broadcasting should move promptly and firmly to stake out its areas of interest and begin seriously to develop the potential of this remarkable addition to the information age.

1	NAME OF BRANCH	PAGE 4
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4	INFORMATION SECTION STARTS	
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 APARTERS

MANUSCRIPT FORM

PAGE _____ OF _____

EXHIBIT D

Lesson 6

DATE: 42

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PHONE - EXT.

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INDEX

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(714) 562-1150

MANUSCRIPT FORM

PAGE _____ OF _____

EXHIBIT D

Lesson 6

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	3 ~~65 pica~~	3	
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	5 THEIR ANTICIPATED PROFITS.	5	
	6 GOVERNMENTS BORROW ON THEIR	6	
	7 RIGHT TO TAX. THIS	7	
	8 CREATES THE AVAILABILITY OF	8	
	9 BONDS AS AN INVESTMENT WITH	9	
	10 THE BORROWER EITHER A	10	
	11 CORPORATION OR A STATE OR	11	
	12 ANY OF ITS SUBDIVISIONS:	12	
	13 (LEGISLATIVE AGENCY, CITY,	13	
	14 TOWN, ETC.).	14	
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	16 PRESS MENU	16	
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MANUSCRIPT FORM

PAGE _____ OF _____

EXHIBIT D

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Lesson 6

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7	GENERATED BY THE SPECIFIC		7
8	PROJECT. (E.G. TOLLS FROM		8
9	THE CORONADO BRIDGE.)		9
10			10
11	GENERAL OBLIGATION-INTEREST		11
12	AND FUNDS FOR PRINCIPAL		12
13	REPAYMENT ARE PROVIDED FOR		13
14	IN THE BUDGET, WHOSE SOURCE		14
15	OF REVENUE IS TAXES.		15
16	PRESS MENU		16

ALTERNATIVE ROUTING

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 COX CABLE
SAN DIEGO

 INDAX
 1175 N. CUYAMACA
 EL CAJON, CA 92020
 (714) 562-1150

APPENDIX A

DETAILED DESCRIPTION OF INVESTMENTS FLOWCHART

The "Understanding Your Investments" flowchart contained seven major branches or divisions much like chapters in a book. The seven branches were presented as menu choices on the investments menu at level 2. The choices were: (1) List of Lessons, (2) Market Barometers, (3) Stock Watch, (4) Bibliography, (5) Course Materials, (6) Mailbag, (7) Glossary of Terms. Each of the branches is described in detail below.

Choice 1: List of Lessons

This section corresponded directly with each thirty-minute television program and contained "class notes" and self quizzes related to the lesson topic. This section presented major concepts, key terms, examples, and a self quiz. The prior lesson also remained active in the data base so users could review the previous lesson. In the initial design, all twelve lessons would be active in the system to facilitate review as well as preview; however, due to system limitations, only two lessons could be "live" in the system at any one time.

The self quiz in each lesson used a variety of formats including fill-in-the-blank, true/false, and multiple choice.

All questions incorporated INDAX's "reveal" function. This function presents a question on the screen but does not display the correct answer until the "reveal" key is depressed.

The largest segment of the investments database was devoted to the "List of Lessons" section. It comprised 12 menus and 234 terminal pages, approximately 75% of the entire "Understanding Your Investments" database.

Choice 2: Market Barometers

Two branches of the database were used for timely market information -- choice 2, "Market Barometers," and choice 3, "Stock Watch." These sections demonstrated investment concepts by charting current economic conditions. By selecting choice 2, "Market Barometers," the user was presented with another menu consisting of six choices -- Overview, Prime Rate, Dow Jones Industrial Average, T-Bill (13 week and 26 week), Gold, and New Hi/Lows. "Overview" summarized in graphic form the performance of all the other items for the current week and preceding week. The remaining selections (Prime Rate, DJIA, T-Bill, Gold, and New Hi/Lows) used bar graphs for visual presentation of each individual barometer for the entire twelve weeks of the program.

Choice 3: Stock Watch

The "Stock Watch" selection was also presented in chart form and included actual stock prices for three consecutive weeks. Six stocks were selected for illustrative purposes -- AT&T, IBM, General Motors, Exxon, K-Mart, and Merck.

Choice 4: Bibliography

When "Bibliography" was selected, the user was given another menu of three choices -- Books, Periodicals, and References. This twelve-page section provided a complete list of appropriate reading and reference materials.

Choice 5: Course Materials

The "Course Materials" selection offered a free supplementary information package containing a variety of pamphlets and booklets on different forms of investments, sample portfolio forms for investment recordkeeping, and T-Bill order forms. The inclusion of this selection was to test the viewer's use of the interactive mode of the INDAX system. The user could order this material through the home shopping channel provided by ViewMart. To order the material, users viewed a series of screens which described the information package and then entered their individual password. ViewMart then provided KPBS with a list of those users who ordered the materials through the home shopping channel.

Choice 6: Mailbag

The "Mailbag" section requested that INDAX viewers mail in their questions to KPBS. These questions were then answered the following week in screens developed for the Mailbag section.

Choice 7: Glossary of Terms

When "Glossary of Terms" was selected, the viewer was given another menu with eight selections. This additional menu was designed to facilitate rapid location of a specific term. The selections were: (1) A-C, (2) D-F, (3) G-L, (4) M, (5) N, (6) O-R, (7) S, and (8) T-Z.

It was originally intended to have each word in the glossary referenced back to the specific discussion in classnotes found in the "List of Lessons" section. However, this was not feasible since only two lessons were "live" at any one time.